Claims

What is claimed is:

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- 1. A method of controlling return path ingress comprising the steps of:
 - (a) detecting the presence of return path ingress in the return frequency band; and
 - (b) mitigating the return path ingress substantially near the subscriber location.
- 2. The method described in claim 1 wherein the detecting of step (a) occurs at the head-end.
- 3. The method described in claim 1 wherein the detecting of step (a) occurs substantially near the subscriber location.
- 4. The method described in claim 1 wherein the detecting of step (a) utilizes ingress measurements extending across the return frequency band.
- 5. The method described in claim 1 wherein the detecting of step (a) takes place in a subband of the return frequency band.
- 6. The method described in claim 1 wherein the detecting of step (a) takes place in an active sub-band of the return frequency band.
- 7. The method described in claim 1 wherein the detecting of step (a) takes place in an inactive sub-band of the return frequency band.
- 8. The method described in claim 1 wherein the detecting of step (a) further comprises the steps of:
 - measuring an average return path signal power in the return frequency band;
 - (ii) comparing the average return path signal power to a detection threshold; and
 - (iii) determining the presence of ingress in the return frequency band based on the result of the comparison.
- 9. The method described in claim 8 further characterized in that the ingress is declared present when the average power exceeds the detection threshold.

- 10. The method described in claim 1 wherein the mitigating of step (a) is accomplished by attenuating the return path signal.
- 11. The method of claim 10 wherein the attenuation is performed based on a power-level equalization algorithm.
- 12. The method described in claim 1 wherein the mitigating of step (a) is accomplished by isolating the return path signal.
- 13. In a cable network environment having a head-end and a subscriber location with return path communications being accomplished in a return frequency band, a method of detecting and mitigating return path ingress, the method comprising the steps of:
 - (a) retrieving information on channel usage to distinguish active sub-bands from inactive sub-bands;
 - (b) detecting the presence of ingress in inactive sub-bands of the return path; and
 - (c) mitigating the return path ingress at a location near the subscriber location.
- 14. The method described in claim 13 wherein the information on channel usage is retrieved from the head-end.
- 15. The method described in claim 13 wherein channel usage is detected automatically at a location substantially near the subscriber location.
- 16. In a cable network environment having a head-end and a subscriber location with return path communications being accomplished in a return frequency band, a method of detecting and mitigating return path ingress, the method comprising the steps of:
 - (a) retrieving information on channel usage to distinguish active sub-bands from inactive sub-bands;
 - (b) detecting the presence of ingress in active sub-bands of the return path; and
 - (c) mitigating the return path ingress at a location near the subscriber location.
- 17. The method described in claim 16 wherein the information on channel usage is retrieved from the head-end.

- 18. The method described in claim 16 wherein channel usage is detected automatically at a location substantially near the subscriber location.
- 19. The method of claim 18 wherein the automated detection of channel usage comprises the steps of:
 - (i) estimating a power spectrum density (PSD) of a return path signal;
 - (ii) correlating the PSD with a set of stored PSDs;
 - (iii) determining a frequency at peak correlation;/and
 - (iv) determining a frequency band in use.
- 20. The method described in claim 16 wherein the active band is in use by an in-home device.
- 21. The method described in claim 16 wherein the active band is in use by a communications gateway.
- 22. In a cable network environment having a head-end and a subscriber location with return path communications being accomplished in a return frequency band, a method of preventing in-home signals from entering an active sub-band of the return path at a location near the subscriber location, the method comprising the steps of:
 - determining the active sub-band wherein the active sub-band is in use by a device located near the subscriber location;
 - (b) monitoring an in-home signal present in the active sub-band; and
 - isolating the in-home signal when the in-home signal is above a predetermined threshold.
- 23. In a cable network environment having a head-end and a subscriber location with return path communications being accomplished in a return frequency band, a method of detecting channel usage at a location near the subscriber location, the method comprising the steps of:
 - (a) estimating the spectrum of an in-home signal;
 - (b) correlating the spectrum with a set of stored spectra; and

- (c) determining a frequency band in use by an in-home device from the result of the correlation.
- 24. A communications gateway for use in a two-way cable environment wherein the communications gateway is capable of reducing return path ingress, the communications gateway comprising:
 - (a) a network side cable connection for transmitting a return path signal onto a cable network;
 - (b) a subscriber side cable connection for receiving the return path signal;
 - (c) an attenuating element for reducing the power in the return path signal which is subsequently coupled to the network side cable connection;
 - (d) a control unit for enabling the attenuating element.
- 25. The communications gateway of claim 24, wherein the attenuating element is a switch.
- 26. The communications gateway of claim 24, wherein the attenuating element is a notch filter.
- 27. The communications gateway of claim 24, wherein the attenuating element is an active amplifier.
- 28. The communications gateway of claim 24, wherein the control unit runs a power-level equalization to control the attenuation value of the attenuating element.
- 29. A communications gateway for use in a two-way cable environment wherein the communications gateway is capable of reducing return path ingress, the communications gateway comprising:
 - (a) a network side cable connection for transmitting a return path signal onto a cable network;
 - (b) a subscriber side cable connection for receiving the return path signal;

- (c) a Radio Frequency (RF) module connected to the network side cable connection and to the subscriber side cable connection, wherein the RF module further comprises;
 - (i) a tap for separating a portion of the power from the return path signal received through the subscriber side cable connection;
 - (ii) an attenuating element for reducing the power in the return path signal which is subsequently coupled to the network side cable connection;
- (d) a control unit for enabling the attenuating element.
- 30. The communications gateway of claim 29, wherein the Radio Frequency module further comprises:
 - (iii) a downstream directional coupler for directing the downstream signal contained in the return path frequency band to the control unit;
- 31. The communications gateway of claim 29, wherein the attenuating element is a switch.
- 32. The communications gateway of claim 29, wherein the attenuating element is a notch filter.
- 33. The communications gateway of claim \$\frac{1}{2}9\$, wherein the attenuating element is an active amplifier.
- 34. The communications gateway of claim 29, wherein the control unit runs a power-level equalization algorithm to control the attenuation value of the attenuating element.
- 35. The communications gateway of claim 29, wherein the control unit of element (d) further comprises:
 - (i) an acquisition stage coupled to the tap and receiving a return path monitoring signal created by the tap;
 - (ii) a power estimation circuit for measuring the power in the return path monitoring signal;
 - (iii) a decision circuit for determining if the return path monitoring signal exceeds a predetermined threshold.

- 36. The communications gateway of claim 29, wherein the control unit of element (d) further comprises:
 - (i) an acquisition stage coupled to the tap and receiving a return path monitoring signal created by the tap;
 - (ii) an analog to digital conversion circuit for digitizing the return path monitoring signal;
 - (iii) a digital signal processing unit for determining the return path monitoring signal power;
 - (iv) a decision circuit for determining if the RF signal exceeds a predetermined threshold.
- 37. The communications gateway of claim 29, wherein the control unit of element (d) further comprises:
 - an acquisition stage coupled to the tap and receiving a return path monitoring signal created by the tap;
 - (ii) a filtering stage for receiving a sub-band of a return path frequency spectrum and creating a filtered return path monitoring signal;
 - (iii) a power estimation circuit for measuring the power in the filtered return path monitoring signal; and
 - (iv) a decision circuit for determining if the filtered return path monitoring signal exceeds a predetermined threshold.